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ORAL HEALTH LITERACY: THE PATHWAY TO APPROPRIATE ORAL HEALTH SERVICE UTILIZATION

Oral health literacy refers to a level of knowledge and awareness about oral conditions and diseases; their prevention and management using appropriate technology. Low levels of oral health knowledge have been linked to poor oral health outcomes including high prevalence of preventable diseases. Low levels of oral health literacy are also associated with poor health seeking behaviors.

The recently released Kenya National oral health survey reported very high levels of oral disease prevalence especially periodontal disease, dental fluorosis and early childhood caries\(^1\). Community awareness on the determinants of these diseases was also reported to be low. Parental awareness is an important risk factor for both the development of early childhood caries and dental fluorosis. This solely because a child’s dentition and wellbeing depends on the parents ability to make the right decisions on behalf of the child. Parents’ dietary practices for their child right from the weaning and oral care including the introduction of tooth cleaning soon after deciduous teeth erupt is paramount for the good oral health of their child. Parents who are not aware on the role of fluoride in domestic water as well as appropriate use of fluoridated toothpaste may expose their children to developing dental fluorosis.

More than fifty years after Kenya gained independence; there is still no enforceable policy on fluoride in drinking water other than guidelines provided by the WHO. This despite the fact that Kenya has large belts of geographical zones that lie within the Great Rift Valley whose waters exceed by far the WHO recommended maximum fluoride levels. Furthermore, the prevalence of early childhood caries as been reported in several studies indicates that about six out of every ten children aged 3-5 years suffer from tooth decay. The manufacture and selling of sugar products even within school communities continues unregulated. Sugar consumption and changing lifestyles are also associated with rising levels of diabetes and obesity among the population. The dental fraternity has not done much to educate the population while no active advocacy has been observed both at national or county government levels to push for appropriate policies on sugar consumption.

Beliefs about the association of infant teething with diarrheal diseases in childhood are very prevalent among many communities. Some of these communities practice infant oral mutilation under the very watch of oral health practitioners. The result is extremely traumatic experiences for very young children. The disturbance caused to the developing dentition may lead to missing deciduous and at times permanent dentition with resultant poor esthetics.

There is therefore need for oral health practitioners to get involved at the community level through empowerment of such communities with appropriate levels of health education. A more preventive and oral health promotive approach will not only lead to a healthier nation, but higher levels of oral health literacy will trigger a demand for appropriate health services. Such engagements with communities would then enable advocacy by groups to lobby both national and county governments for provision of safe drinking water, formulation of policies to regulate the manufacturing, packaging and the selling of confectionaries, while also demanding for appropriate oral health services.
Regina M. James

Public Health Specialist and Senior Lecturer in Community and Preventive Dentistry at the University of Nairobi

References

ASSOCIATION OF FEVER AND DIARRHEA WITH INFANT TEETHING AMONG MOTHERS ATTENDING TWO HEALTH CENTRES IN NAIROBI

Regina Mutave James¹, Loice W.Gathece¹, Arthur M. Kemoli²

¹Department of Periodontology, Community and Preventive Dentistry, University of Nairobi
²Department of Pediatric Dentistry and Orthodontics, University of Nairobi

Key Words: Infant teething, diarrhea, fever, mothers

Abstract

Introduction: Many global communities associate infant teething with diarrhea and fever. The perception that infant teething is a cause of pain and discomfort is often shared by both mothers/caregivers and healthcare workers and influences the choice of remedies used for the management of infant teething.

Materials and methods: This descriptive cross-sectional study was conducted among mothers presenting at two health centres in Nairobi in November-December 2014. Mothers who presented to the health centres with infants aged 0-3 months were sequentially recruited and screened to establish if they had older children. Only mothers who had older surviving children were included in the study. An interviewer administered closed ended questionnaire was used for data collection. Data was entered into IBM® SPSS® Statistics Version 20 and analysed for frequencies, while chi-square test of significance was used for categorical variables (confidence level set at 95%, α<0.05).

Results: A total of 399 mothers satisfied the inclusion criteria and their age ranged from 19 - 48 years (Mean 28.25, SD 4.59). A total of 377 (94.5%) mothers responded to the question on whether they perceived fever to be associated with teething, while 376 (94.2%) responded to the question on whether diarrhea was associated with teething. Majority of mothers associated infant teething with fever 288(76.4%) and diarrhea 278(73.9%). Mothers association of infant teething with diarrhea and fever did not differ significantly according to mothers age (p=0.527 and p=0.282) and the highest level of education attained (p=0.093 and p=0.573), and the highest level of education attained (p=0.093 and p=0.573), Mothers’ association of diarrhea with infant teething different significantly with mothers employment status (p=0.009). More than half 17(55.2%) of mothers whose children had experienced diarrhea in the preceding two weeks sought treatment at health facilities, while 3(10%) used home-made remedies. Slightly below half 14(44.8%) of mothers whose children experienced fever sought treatment at the health centres. Majority of mothers 152(67%) consulted the nurse at the health clinic while 34.5% of mothers utilized commercially available teething powders and/or gels during infant teething.

Conclusion: Mothers knowledge on the association of infant teething with diarrhea and fever could impact on their health seeking behavior.

Introduction

A wide range of conditions have been attributed to teething by different global communities, and they include diarrhea, fever, vomiting, convulsions, coughing, ear infection, sleep disturbance among many others¹³. The exact origin of the traditional beliefs and practices about teething is not known, but studies have reported that during the nineteenth century, records of cause of death for 12% of all children younger than four years in England were attributed to teething, while in France of 50% of all infant deaths from the sixteenth to nineteenth century had teething as their cause³. More recent studies from Australia, America and many parts of Africa have reported that high numbers of mothers and even healthcare workers attribute common childhood illnesses to teething²³⁵⁻⁸. The perception that teething causes pain and discomfort is shared by both mothers/caregivers and medical personnel⁵⁻⁸.
Confusion on this matter is further complicated because the child cannot express itself verbally, and those around it are left to interpret the non-verbal communication.

At birth, all crowns of the deciduous teeth are fully mineralised and root formation is ongoing. The teeth advance axially towards their erupted position and may present as obvious bulges within the gum pads. The tooth follicle is a source of eicosanoids, cytokines and growth factors which aid in tooth eruption and have also been linked to the occurrence of localized symptoms related to the teething period among them; low-grade fever, drooling of saliva and itchiness of gums\(^9,10\). Teething pain may thus be a manifestation of inflammatory mediators in the crevicular fluid surrounding the erupting tooth. Studies indicate that such symptoms can be relieved by massaging the gums, biting on teething rings, as well as administering of gels or powders with soothing effects on the gums.

The age of mothers/caregivers has been shown to influence the choice of the home remedies used for teething-related illnesses, while other studies report that the caregivers level of education has no association with the caregivers home remedy use\(^11,12\). The current study was designed to investigate the association of fever and diarrhea among mothers attending two health centres in Nairobi, and to describe their health seeking behaviours.

**Materials and methods**

This was descriptive cross-sectional study which aimed at collecting baseline information as part of a health education intervention study among mothers presenting at two conveniently selected health centres in Nairobi; Westlands and Makadara health centres. This study was approved by the Kenyatta National Hospital/ University of Nairobi ethics and standards committee (REF P677/12/2012). Mothers with who presented to the clinics with infants aged 0-3 months were interviewed to establish if they had an older surviving child. Those who satisfied this criteria and the consenting procedures were sequentially recruited into the study until the desired sample of 385 mothers was achieved. An interviewer administered closed ended questionnaire was used for data collection. Data was entered into IBM SPSS Statistics Version 20 and analysed for frequencies, while chi-square test of significance was used for categorical variables with the confidence level set at 95% (\(a\leq 0.05\))

**Results**

A total of 399 mothers satisfied the inclusion criteria; 200 mothers from Westlands health centre and 199 from Makadara health centre. Mothers’ age ranged from 19 to 48 years (Mean 28.25, SD 4.59). Mothers were drawn mainly from low socio-economic group as 280(70.4%) indicated they lived in single roomed dwellings with shared washrooms. About a third 120(30.4%) of mothers were aware that their children were exposed to stagnant water and open drainage/sewers. The majority 319 (80.2%) of mothers interviewed had access to piped water, but about one fifth 79(19.8%) of mothers purchased water from vendors.

Mothers ethnicity across the two health centres differed significantly (\(p=0.000\)). There were more from the Kamba (28.8%) ethnic group mothers in Makadara while Westlands had more mothers from the Luhya (34.6%) ethnic group (Table 1).
## Table 1 Mothers Ethnic Background

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>Category</th>
<th>Westlands HC n(%)</th>
<th>Makadara HC n(%)</th>
<th>X²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnic Background</td>
<td>389</td>
<td>Kalenjin</td>
<td>4(2.1)</td>
<td>2(1.0)</td>
<td>30.012, df=6</td>
<td>0.000″</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kamba</td>
<td>21(11.0)</td>
<td>57(28.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kikuyu</td>
<td>64(33.5)</td>
<td>57(28.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luo</td>
<td>13(6.8)</td>
<td>21(10.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luo</td>
<td>6(3.1)</td>
<td>18(9.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Luo</td>
<td>3(1.6)</td>
<td>6(3.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kamba</td>
<td>19(10.9)</td>
<td>37(18.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kamba</td>
<td>4(2.1)</td>
<td>9(4.5)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Fishers Exact statistic reported, *Indicates result is statistically significant at a ≤ 0.05

### Association of infant teething with diarrhea and fever by mothers

Majority of mothers associated infant teething with fever 288(76.4%) and diarrhea 278(73.9%). Mothers association of infant teething with diarrhea and fever did not differ according to mothers age (p=0.527 and p=0.282) and the highest level of education attained (p=0.093 and p= 0.573). The association of diarrhea with infant teething however different significantly with mothers employment status (p=0.009)(Table 2).

<table>
<thead>
<tr>
<th>Socio-demographic Variable and characteristics</th>
<th>Association of teething with diarrhea</th>
<th>Association of teething with Fever</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good knowledge n(%)</td>
<td>Inadequate Knowledge n(%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;24 years</td>
<td>17(22.7)</td>
<td>58(77.3)</td>
</tr>
<tr>
<td>25-34 years</td>
<td>70(26.4)</td>
<td>195(73.6)</td>
</tr>
<tr>
<td>35 years</td>
<td>15(33.3)</td>
<td>20(66.7)</td>
</tr>
<tr>
<td>Highest education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upto Primary level</td>
<td>30(22.1)</td>
<td>106(77.9)</td>
</tr>
<tr>
<td>Secondary level</td>
<td>41(25.0)</td>
<td>123(75.0)</td>
</tr>
<tr>
<td>Tertiary level</td>
<td>27(35.5)</td>
<td>49(64.5)</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>38(19.5)</td>
<td>157(80.5)</td>
</tr>
<tr>
<td>Formal employment</td>
<td>18(28.6)</td>
<td>45(71.4)</td>
</tr>
<tr>
<td>Self-employed</td>
<td>41(35.0)</td>
<td>76(65.0)</td>
</tr>
</tbody>
</table>

There was no significant difference between mothers ethnic backgrounds with their association of infant teething with diarrhea (p=0.300) and fever (p=0.056) (Table 3)
Table 3 Relationship Between Mothers Ethnic Background And Association Of Diarrhea And Fever With Infant Teething.

<table>
<thead>
<tr>
<th>Ethnic Background</th>
<th>Association of teething with diarrhea n=368</th>
<th>Association of teething with Fever n=369</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good knowledge n(%)</td>
<td>Inadequate Knowledge n(%)</td>
</tr>
<tr>
<td>Kalenjin</td>
<td>2(40.0)</td>
<td>3(60.0)</td>
</tr>
<tr>
<td>Kamba</td>
<td>18(24.0)</td>
<td>57(76.0)</td>
</tr>
<tr>
<td>Kikuyu</td>
<td>37(32.5)</td>
<td>77(67.5)</td>
</tr>
<tr>
<td>Luo</td>
<td>7(21.2)</td>
<td>26(78.8)</td>
</tr>
<tr>
<td>Kisii</td>
<td>11(33.3)</td>
<td>22(66.7)</td>
</tr>
<tr>
<td>Others</td>
<td>3(27.3)</td>
<td>8(72.7)</td>
</tr>
</tbody>
</table>

Mothers health seeking behaviour

Most mothers 316(79.4%) had visited the health centre for children's immunization or routine growth monitoring. A total of 82(20.8%) of children had experienced illness in the preceding two weeks. Thirty children (7.6%) had diarrhea, while 32(8.8%) had experienced fever. More than half 17(56.7%) of mothers whose children had experienced diarrhea sought treatment at health facilities, while 3(10%) used home-made remedies for the management of diarrhea, another 10(33.3%) did not seek any treatment. Slightly below half 14(44.8%) of mothers whose children experienced fever sought treatment at the health centres, while 55.2% said the fever resolved without treatment. Management for children who had suffered diarrhea or fever in the preceding two weeks is summarized in Table 4.

Table 4 Mothers health seeking behavior

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>category</th>
<th>Westlands</th>
<th>Makadara</th>
<th>X²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason for current visit to health centre</td>
<td>398</td>
<td>Immunization/ Growth monitoring</td>
<td>159(79.9)</td>
<td>157(78.9)</td>
<td>5.193, df=2</td>
<td>0.075</td>
</tr>
<tr>
<td>Seek Medical care</td>
<td></td>
<td></td>
<td>12(6.0)</td>
<td>23(11.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td>28(14.1)</td>
<td>19(9.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of Diarrhea in the preceding two weeks</td>
<td>20</td>
<td>ORS/Oralite</td>
<td>7(70.0)</td>
<td>10(100)</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Home-made sugar-salt solution</td>
<td></td>
<td></td>
<td>1(10.0)</td>
<td>0(0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other- Home made remedies</td>
<td></td>
<td></td>
<td>2(20.0)</td>
<td>0(0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of Fever in the preceding two weeks</td>
<td>28</td>
<td>Anti-Malarials</td>
<td>1(11.1)</td>
<td>3(15.8)</td>
<td>1.753, df=2</td>
<td>0.464</td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
<td>1(11.1)</td>
<td>6(31.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-pyretics</td>
<td></td>
<td></td>
<td>7(77.8)</td>
<td>10(52.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---- No X² value as some cells have 0 score, # Fishers Exact statistic reported.
Some mothers indicated that they had sought professional assistance when their older child experienced teething-related symptoms (Table 5). The majority of mothers 152(67%) consulted the nurse at the health clinic. About one third of mothers (34.5%) utilized commercially available teething powders and/or gels. A small minority 4(2%) of mothers however still utilized the services of traditional practitioners for the management of their children during infant teething.

Table 5: Mothers Health Seeking Practices For Teething-related Symptoms For Older Child

<table>
<thead>
<tr>
<th>Practice</th>
<th>Frequency Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulted the Nurse at Health clinic (n=227)</td>
<td>152 (67)</td>
<td>75 (33)</td>
</tr>
<tr>
<td>Consulted a pediatrician (n=195)</td>
<td>9 (4.6%)</td>
<td>186 (95.4)</td>
</tr>
<tr>
<td>Applied commercial teething powder/gel (n=203)</td>
<td>70(34.5)</td>
<td>133 (65.5)</td>
</tr>
<tr>
<td>Applied traditional teething powders (n=198)</td>
<td>9 (4.5)</td>
<td>189 (95.5)</td>
</tr>
<tr>
<td>Consulted an oral health practitioner (n=193)</td>
<td>10 (5.2)</td>
<td>183 (94.8)</td>
</tr>
<tr>
<td>Visited traditional practitioner for gum incision (n=197)</td>
<td>4 (2)</td>
<td>193 (98)</td>
</tr>
</tbody>
</table>

Discussion

This was a descriptive cross-sectional study among mothers attending two health centres in Nairobi. Due to the study design and the sampling procedures used during this study, the findings should be interpreted with caution as they may not be generalizable to whole population of mothers in Nairobi. However, these finding shed light on the important subject of infant teething, mothers perception about the symptoms associated with infant teething as well as the practices in the management of such symptoms.

Mothers who participated in this study were literate as 254 (63.7%) had completed secondary school level of education. General average adult literacy levels in Kenya have been recorded at 66.4%13. This group of relatively young mother was thus comparable to the Kenyan population average literacy levels. Low literacy levels have been associated with low health literacy scores, and impact negatively on oral health behavior and health seeking behaviors14,15. High unemployment status continues to be a challenge for the country. About half 204(51.5%) of all mothers interviewed were not engaged in any form of employment prior to the delivery of the current child. This is inconsistent with the unemployment rates in Kenya where female unemployment rate has been reported at 10.5% in 201216. More mothers in this study who were unemployed recorded inadequate knowledge on the association of teething with diarrhea (p=0.009) compared to those in formal employment and the self-employed. Majority of mothers (79.4%) had visited the health facility for child immunization and monitoring services. Kenya has programs for maternal and child health care which include immunization and growth monitoring for children under the age of 5 years. The recorded national statistics of fully immunized children was 82%, with Nairobi’s County recording 94.5% in 201217.

Majority of mothers in this study associated infant teething with fever 288(76.4%) and diarrhea 278(73.9%). This compares closely with findings of a study involving pediatricians, pediatric dentists and parents in Iowa, where 74.6% of the study participants associated fever with infant teething while 56.7% associated teething with diarrhea5. In a different study conducted among parents attending maternity and child health clinics in Jordan, 84.9% of them associated fever with teething while 71.8% associated diarrhea with teething8. Studies that have utilized prospective study designs of
children during the eruption period of deciduous dentition and those that have reviewed records of illnesses during the period of deciduous teeth eruption have reported fewer cases of diarrhea and fever during the teething period\textsuperscript{4,18}.

Only 44.8\% of mothers whose children had experienced fever in the preceding two weeks sought treatment at the health centre. Previous studies have indicated that although parents perceive fever as dangerous, majority have poor knowledge on recognition of fever, and are not able to accurately measure fever\textsuperscript{17}. Unrealistic fear of fever which causes panic when children are feverish has been documented\textsuperscript{17}. Kenya has malaria endemic zones and prompt treatment with effective anti-malaria drugs for children with fever in malaria risk areas has been advocated as a key intervention in reducing child mortality\textsuperscript{19}. During the time period 2000-2004, the number of children in Kenya under five who presented with fever and were treated with any anti-malarial drugs constituted 27\% of the children, which reduced to 24\% for the period 2005-2009\textsuperscript{19}. Febrile diseases in childhood tend to easily lead to fatality if untreated. Parents associating fever with teething may fail to take their children to health facilities for diagnosis and management, thus resulting in possible consequences.

Diarrheal diseases are responsible for about 1.8 million child-deaths annually worldwide\textsuperscript{19}. In the current study, 7.6\% of children had suffered diarrhea within the last two weeks, and 55.2\% of mothers sought treatment at the health facilities (Table 1). Diarrhea is often linked to low level of mothers’ education, poor sanitary conditions and lack of safe drinking water\textsuperscript{20}. Loose stools in infants can also be associated with introduction of foods before the infant’s digestive system is adequately developed. The Global Strategy for Infant and Young Child Feeding developed jointly by WHO and United Nations Children’s Education Fund (UNICEF) recommends exclusive breastfeeding of infants for the first six months of life without receiving any solids or liquids except vitamins, minerals, or medicines\textsuperscript{21,22}. The recommended first line of management for diarrhea in children is utilization of oral rehydration therapy. There should also be emphasis on the provision of safe drinking water for children under the age of five years to minimize diarrheal episodes. The influence of the continued association by majority of mothers of teething with diarrhea in children requires further investigation.

Teething remedies used for the management of pain or perceived discomfort are often not prescribed by the dental practitioner, rather many are over-the-counter medication, while other preparations including herbal therapies are passed down generations. About a third (34.5\%) of the study participants reported using teething gels/powders to manage teething-related symptoms in their older child. Teething remedies can largely be classified as either pharmacological or non-pharmacological. Most pharmacological therapies for teething aim at achieving analgesia or local anaesthesia. Preparations of analgesic gels containing paracetamol, ibuprofen and choline salicylate have been applied topically\textsuperscript{11}. Other preparations with anaesthetic combinations like benzocaine and lignocaine are also applied topically. Evidence for the effectiveness of these analgesics and anaesthetic preparations is weak and some adverse reactions associated with them have been reported in literature\textsuperscript{11,12}. Chronic use of choline salicylate may induce intoxication and has also been associated with methemoglobinemia, a rare but serious condition\textsuperscript{24}. The administration and use of most teething powders/gels lacks proper dose dispensation mechanisms and their use has been discontinued in some countries over safety concerns. There is need for monitoring of the use of teething gels/powders in the market and to properly advise mothers in order to avoid adverse effects as a result of their use.

Despite the high literacy among mothers reported in this study population, beliefs may affect utilization of health services by mothers and slow the achievement of optimal child health. Furthermore,
previous studies have reported harmful practices of canine tooth-bud enucleation, often practiced by communities associating teething with persistent fever and diarrhea with resultant fatalities. Emphasis should be placed on educating mothers on the determinants of diarrhea especially hygiene practices, the need for clean and safe drinking water and appropriate weaning practices. These factors have the potential to reduce the number of children experiencing diarrhea and thus minimize the beliefs around the association of infant teething with diarrhea.

**Conclusion**

Majority of mothers in the studied population associate infant teething with diarrhea and fever. Management of teething-related symptoms is often done in consultation with nursing staff at the child health clinics within health centres. The use of teething powders/gels is prevalent with over a third of mothers utilizing them during infant teething. The practice of utilizing teething gels/powders should not be encouraged as the dosage and safety are of concern. Few mothers still use the services of traditional practitioners for the management of teething-related illnesses in their young children.

**Conflict of interest:** The authors declare no conflict of interest

**Acknowledgements:** The authors wish to acknowledge the county health officers who facilitated data collection within the health centres; Nursing officer in-charge, Makadara Mrs Mwakisha and Mr Thuranira, the Nursing officer in-charge of Westlands health centres for assisting with space for data collection. We also recognize the contribution of all mothers who so willingly participated in this study.

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DIAGNOSIS AND MANAGEMENT OF IDIOPATHIC GINGIVAL FIBROMATOSIS:

A CASE REPORT

Mwai G.K¹, Wagaiyu E.G¹

¹Department of Periodontology, Community and preventive dentistry
¹School of Dental Sciences, University of Nairobi

Abstract

Idiopathic gingival fibromatosis is a rare condition characterized by slow progressive gingival overgrowth with little tendency to bleed. In severe cases, the gingival enlargement may cover the crowns of the teeth and cause aesthetic, emotional, psychological and functional disturbances. It may occur as an isolated trait or part of a syndrome. We report the diagnosis and management of a case of non syndromic idiopathic gingival fibromatosis in a 19 year-old female.

Keywords: idiopathic gingival fibromatosis, gingival enlargement, gingivectomy, gingivoplasty, case report

Introduction

Gingival enlargements/overgrowths area normal progressive growths of the gingivae caused mainly by proliferation of underlying fibrous connective tissue but could also be due to cellular proliferation. Gingival overgrowth usually results in aesthetic disturbances, interference with lip closure, speech and masticatory impediment, dental malocclusions, higher risk of dental caries and periodontal disease due to challenges in performing good plaque control(1, 2). Acquired factors such as plaque induced inflammation can lead to enlargement of the gingiva. Adverse drug reactions and hereditary factors are also common causes of gingival enlargement. Drugs commonly implicated include: Anticonvulsants (e.g. Nifedipine), Immunosuppressants (e.g. Cyclosporin A), and antihypertensive drugs (e.g. Calcium channel blockers)(3). The prevalence of gingival overgrowth among patients on antihypertensive drugs has been reported as 20.7% in a study done in Kenya by Wetende et al 2014(4). In rare cases (1 in 750,000) people(5), the gingival overgrowth trait is inherited and hence referred to as hereditary gingival fibromatosis (HGF). Locally, a study by Wagaiyu et al 2009 reported a case series of a family affected by hereditary gingival Fibromatosis and its management(6).

Idiopathic gingival fibromatosis (IGF) is a rare disorder characterized by a slow progressive, benign fibrous gingival enlargement with no definite cause(7). The gingiva appears normal pink in color, has a firm consistency, has little tendency to bleed and may have a pebbled, “cobblestone” or a uniform leathery texture. The enlargement may partially or totally cover crowns of the teeth causing tooth mal-alignment, altered eruption and pseudopockets(8). Excessive gingival tissues also predispose the individuals to dental caries and periodontal disease due to interference of plaque control.

Idiopathic Gingival Fibromatosis can be classified into two types according to its form. Anodular form characterized by the presence of multiple enlargements in the gingiva and asymmetric form characterized by uniform enlargement of the gingiva(9). Histologically, the overlying epithelium appears thickened with elongated reteridges with a marked increase in the connective tissue mass which is relatively avascular, has thickened bundles of collagen fibers and numerous fibroblasts. The alveolar bone is not usually affected(10).

Several band mutations on chromosomes 2, 4, 5 and 11 have been implicated in IGF. These include: 2p21-p22 (GINGF), 2p13-p16, 2p22.3-23 (GINGF3), 5q13-q22 (GINGF2) and 4q21. Hart and
colleagues identified a mutation in the *Son of Sevenless-1 gene* (SOS1) as a possible cause of isolated (non syndromic) gingival fibromatosis\(^{(11)}\). IGF usually develops as an isolated condition but may be part of the clinical characteristics of a diverse syndrome. Some examples of syndromes are shown in table 1. Treatment consists of surgical excision of the excessive tissue to restore gingival contours.

**Table 1: Examples Of Syndromes Associated With Gingival Enlargement**

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimmerman–Laband syndrome(^{(12)})</td>
<td>Syndactyly, ear and nose abnormalities, hyperplasia of nails and terminal phalanges, hepatosplenomegaly, mental retardation</td>
</tr>
<tr>
<td>Klippel–Trenaunay–Weber syndrome(^{(13)})</td>
<td>Port-wine stains in skin, varicose veins, and bony and soft tissue hypertrophy</td>
</tr>
<tr>
<td>Cross syndrome(^{(14)})</td>
<td>Microphthalmia, pigment defects and mental retardation</td>
</tr>
<tr>
<td>Ramon syndrome(^{(15)})</td>
<td>Hypertrichosis, mental retardation, epilepsy, delayed milestones, epilepsy and cherubism</td>
</tr>
</tbody>
</table>

The purpose of this case report is to present the diagnosis and management of a case of non syndromic idiopathic gingival fibromatosis in a 19 year-old female.

**CASE REPORT**

A 19 year old otherwise healthy female patient accompanied by her parents presented to the periodontology clinic at The University of Nairobi Dental Hospital, with a complaint of swollen gums affecting her appearance and inability to brush her teeth well. She reported that the gum swelling had gradually increased over 10 years beginning with the gums around the front teeth. She had had several extractions over the duration due to grossly carious non restorable teeth. Family, drug and medical history were non contributory. Extraoral examination showed lip incompetence (Figure 1) with a hyperactive mentalis and a convex facial profile. She had no craniofacial or other abnormalities.

Intraoral examination revealed enlarged gingivae with a pebbled “cobblestone” appearance pronounced on maxillary labial aspect, mandibular labial and lingual aspects; affecting interdental papillae and attached gingivae creating pseudopockets, edentulous spans showed no gingival enlargement, the gingival colour was pale pink with physiologic pigmentation and a generally firm consistency (figure 2). Anterior sextants showed crowding; there was loss of vertical dimension posteriorly due to supraeruption into edentulous spans. Panoramic radiography revealed no underlying abnormality in alveolar or basal bone; bite wing radiographs revealed two carious lesions.

**Figure 1:** Close up frontal view of lip incompetence. Of note are the medium smile line, exposed gingival enlargement and teeth mal-alignment.
In light of the clinical observations and the history, a diagnosis of non syndromic Idiopathic gingival fibromatosis was made. The treatment objectives were to maintain good plaque control, restore the two carious teeth and improve dento-gingival esthetics.

Complete occlusal rehabilitation was not possible at this stage because the patient declined to have extraction of supraerupted teeth and orthodontic treatment to re-align the teeth. Initial periodontal treatment including oral hygiene instruction, scaling and oral prophylaxis was done.

Following the clearance of inflammatory areas and attainment of good plaque control, the surgical procedure of gingivectomy and gingivoplasty was carried out arch by arch on separate visits under local anaesthesia. External bevel gingivectomy was performed (Figure 5) after marking the periodontal sulcular depths. Periodontal dressing of Zinc Oxide Eugenol (Coe Pack™) was placed post-operatively to minimize discomfort. The healing process was uneventful.

Histopathology of the resected gingival tissues showed stratified squamous epithelium with normal morphology overlying a collagenous relatively avascular connective tissue matrix with pockets of chronic inflammatory cells as illustrated in figure 7. This confirmed the clinical diagnosis.
Figure 5: Scalloped external bevel incision using a Kirkland gingivectomy knife

Figure 6: Excised gingival tissue of one quadrant of the maxilla
Treatment outcome

The case was followed up post operatively over 4 weeks and 6 weeks and the healing was uneventful. The patients’ plaque control was good and dental restorations intact. The gingival tissues were restored to normal contours. Of note was a scattered distribution of physiologic pigmentation in the gingiva as well as mild inflammation in the lower arch at two weeks post operative (Figure 8). The patient was educated on the need to maintain good plaque control. The patient reported to be happy with the outcomes and is currently on a follow up regime.

Discussion

This case report describes a case of non syndromic Idiopathic gingival fibromatosis occurring gradually over a ten year period. The etiology of the patient’s gingival overgrowth was unknown with no contributory family or drug history and no apparent association with any medical conditions. The gingival overgrowth was possibly exacerbated by air exposure due to lip incompetence.
Surgical treatment by gingivectomy and gingivoplasty resulted in remarkable esthetic and functional improvement with no recurrence in the short term follow up. However, the patient is being followed up for long term effects.

The precise cellular and molecular mechanism of idiopathic gingival fibromatosis is unclear. Literature describes a possibility of increased proliferation of gingival fibroblasts, or increased collagen synthesis and cross linking due to abnormal post translational mechanisms. The increase in collagen cross-links reduces susceptibility to matrix metalloproteinase degradation thus favoring its accumulation. It is possible that this case was a spontaneous mutation or hereditary disorder with variance such that other family members were unaffected, however this was not confirmed as genetic testing was not carried out.

Similar presentation, surgical management of IGF by conventional gingivectomy and gingivoplasty as well as histopathological appearance was reported by Ramnarayan. The most effective technique of removing excessive gingival tissue is via conventional external bevel gingivectomy especially where there are pseudopockets (no clinical attachment loss). Alternative techniques include the use of soft tissue diode lasers, electrocautery and ledge and wedge procedure with internal bevel gingivectomy as a more conservative technique. This case was unique given the scattered distribution of physiologic pigmentation on healing as well as air drying of gingivae due to lip incompetence which may have had an influence on the microbial ecosystem.

Fibrotic gingival overgrowth is rare but important due to the effects on aesthetics and functional disturbance it creates inpatients and also the potential of being used as an indicator of syndromes. This clinical case report is relevant as a valuable resource of information, increasing awareness among clinicians as well as stimulating further research on rare debilitating conditions like this one. However, limitations include the retrospective nature of the case report which poses challenges in establishing cause and effect patterns especially genetic ones as well as a tendency to focus on the unusual.

**Recommendation**

Timely diagnosis and management is important to avoid the various adverse secondary effects of the gingival overgrowth. It is difficult to predict recurrence, however, the patients psychological and functional benefits of intervention outweigh the risk of recurrence. Practitioners should be alert for abnormalities that may indicate multisystem syndromes.

**Conclusion**

Idiopathic gingival fibromatosis is a rare disorder with a poorly understood etiopathogenesis. Management should include: comprehensive medical, dental history and physical examination to rule out any causative factors, improvement in patient performed plaque control. Gingivectomy and gingivoplasty improves esthetics, patient’s psychological status and enhances function. Further cellular and molecular studies are required to unravel underlying mechanisms in the aetiology of IGF.
Acknowledgements

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REFERENCES

KNOWLEDGE SELECTION AND USE OF BONDING AGENTS BY DENTISTS IN NAIROBI.

Munene D.M, Mutave R.J and Kisumbi B.K

1 Final year BDS student, School of Dental Sciences, University of Nairobi.
2 Senior Lecturer, Department of Periodontology Community & Preventive Dentistry, School of Dental Sciences, University of Nairobi.
3 Senior Lecturer, Department of Conservative and Prosthetic Dentistry, School of Dental Sciences, University of Nairobi

ABSTRACT

The use of bonded restorations has been on the rise due to increasing demand on aesthetics, conservation of tooth structure and consistent results in the adhesion of direct and indirect restorations. Consequently, tooth resin bonding agents (TRBAs) have been highly researched and developed yielding a dynamic and vast range of bonding systems. However, development of new products with over emphasis on improved handling profile has led to compromise of bond strength, microleakage, and durability among other properties of the materials. Nevertheless dentists have to be well conversant with properties of novel bonding agents that are progressively being improved for appropriate indications and application. Documented reasons for selection of bonding agents include availability, ease of use, cost and reliability.

Objective: The aim of the study was to investigate the knowledge, criteria of selection and use of bonding agents for bonded restorations.

Design: A descriptive cross-sectional study.

Study area: The study was carried out in Nairobi, the capital city of Kenya.

Study population: Registered dental practitioners in the public and private sectors in 2013.

Materials and Methods: A self-administered semi-structured questionnaire was distributed to a randomly selected sample of 79 dentists drawn from the study population. Data collected was analyzed and presented in form of text, tables and graphs. Statistically significant differences were identified using chi square test at a level of p < 0.05.

Results: Majority of the dentists were aware of the 2-step bonding agents, 47 (77%) knew of self-etching primer and adhesive whereas 30 (49.2%) knew about the self-etching adhesive. More than half (35 (57.4%) were aware of the most recently developed self-etching no rinse systems and 36 (59%) were acquainted with the total etch technique (3 step etcher). A sizeable number 35 (57.4%) reported appropriate durations of etching dentine 5-15 seconds. However, 37.7% indicated longer etching durations ranging from 29 seconds to 2 minutes whereas 4.9% indicated shorter durations of 1-5 seconds. The reasons considered by dentists during selection of dentine bonding agents were high bond strength (42.6%), ease of use (44.38%), availability (57.40%), cost (31.18%) and other reasons (1.68%). On the usage of bonding agents, most dentists 65.68% indicated that they frequently use 5th generation bonding agents whereas (45.98%) reported that they frequently applied 4th generation bonding agents. The least used Dentine bonding agents (DBA's) were 6th and 7th generations (13.10%) and 6.6% respectively.

Conclusion: Within the limitations of this study, knowledge on bonding agents was found to be relatively high with most dentists being aware of 3 and 2 step DBA's. Knowledge on the recommended etching time for dentine was however average. The most frequently used DBA’s were 4th and 5th.
Introduction

Bonding agents are invaluable materials in modern dentistry as the need for adhesive restorations has considerably increased in the past three decades. They mediate adhesion to dental adherends majorly direct and indirect restorations and without them, it would be right to conclude that it wouldn’t be possible to place successful dental restorations. Bonding agents are widely used in routine dental procedures to bond composite, compomer and amalgam restorations where the adhesion also reinforces the residual enamel and dentine structures. The basic composition of a tooth resin bonding agent include acid etchants, primers, adhesives, initiators and accelerators. They may also contain fillers.

Since the first use of tooth resin bonding agents (TRBAs) in 1955, there has been continuous and rapid development, which has been a challenge for dentists to keep up with advances in these materials. Buonocore is regarded as the father of adhesive dentistry after finding out that acid-etching enamel caused a large increase in resin-enamel bond strength to approximately 20 to 25 MPa. The success of bonding resins to acid-etched enamel has been achieved due to the fact that enamel contains little protein, and it can be dried without causing any collapse of the roughened surface. However, whereas the bond to enamel has been established, adhesion to dentine has seen a turbulent history that has been characterized by gradual understanding of the microstructure of dentine yielding progressively improved generations of dentine bonding agents.

Bonding agents are presented in generations, the categories widely in use today among dentists are 4th through 7th. Lately, an 8th generation has been developed. Another way to classify bonding agents would be total-etch versus self-etch. With newer generations, self-etch has been more adopted as it emphasizes on reduction in the number of handling steps. Clearly, in the selection of a bonding agent, a dentist has to put into consideration several factors. Ideally a bonding agent should form an immediate bond strength of 17MPa, be hydrophilic and not be technique sensitive. Moreover most popular reasons for choice of DBA were reported to be availability, ease of use cost and reliability McFadzean et al. Further, the systems of bonding agents taught in dental schools ultimately impact on the knowledge and use of these materials. In a study on the dental materials commonly taught and used in dental schools in Canada and the United States of America it was established that 4th and 5th generation total etch were the most common bonding systems taught in dental schools.

In terms of clinical performance, once placed and polymerized, 7th generation one-bottle primer/adhesives are significantly more hydrophilic than their 4th, 5th, and 6th generation counterparts. The clear consensus is that 7th generation adhesive systems, at least at this point, are not as predictable as earlier 4th, 5th, and 6th generation systems. Although there are some recently introduced 7th generation systems that show promise, it is the author’s opinion that despite offering ease and simplicity 7th generation adhesive systems for now should be used very selectively, if at all, until improvements are made and independent research clearly demonstrates short- and, more importantly, long-term clinical effectiveness.

The fifth generation bonding agents which comprise of self-etching primers and adhesive or etch
and primer-adhesives has been reported as the most popular DBA’s in use today. It is important for dentists to understand that although simplified systems are indeed easier and more convenient to use, there may be a trade-off in long-term clinical effectiveness with some systems. Interestingly, at least one manufacturer has gone full circle and, despite selling both a 5th and 6th generation system, recently introduced a new 4th generation system that is basically a modification of a successful total-etch system of some 30 years ago.

Therefore due to the continuous development of material science and technology among the tooth resin bonding agents, it is provident that dental professionals keep up with the ever dynamic information. Hence the aim of this study was to establish these parameters in Nairobi, Kenya.

Materials and methods
Study design
Descriptive cross-sectional design.

Study Area
The study was conducted in Nairobi, the capital city of Kenya that captures most of the dentists in both private and public practice. It is also an urban area where a lot of restorative dentistry takes place.

Study Population
All registered dentists in both public and private practice in Nairobi city.

Sampling Method
Registered dentists operating in Nairobi selected using simple random sampling. The Kenya medical practitioners and Dentists board register was used in this selection. Thereafter, the Kenya Postal Corporation directory 2013 was used to identify the exact locations of these dentists.

Sample Size Determination
The sample size was determined as a total of 79 dentists from both the public and private sector.

Data Collection Method
The data is comprised of self-administered questionnaires filled by the sample population and collected for analysis.

Data Analysis
The data collected was coded and entered into a computer and analyzed using the statistical package for social sciences (SPSS) version 16.0 and Microsoft office excel 2007. The confidence level in this study was 95% and the p-value for statistical significance was set at less than 0.05.

Ethical consideration
The proposal was submitted to the Kenyatta National Hospital and University of Nairobi ethics,
research and standards committee for approval. Permission to carry out the investigations was sought from the relevant authorities and from the school of dental sciences. The subjects were informed about the study and consent was obtained prior to their participation in the study. The data was collected in a discrete and anonymous manner and information obtained was treated with utmost confidentiality. The subjects were allowed to withdraw from participation at any point during the study without penalty. The results obtained from the study will be used to benefit the participants and the community.

Results

A total of 79 respondents were involved in the study. Of these, 61 (77.22%) had responded by the time data analysis was done. Those practicing in the public sector were 14 (22.95%) of whom 7 (50%) were male and 7 (50%) were female. Those in the private sector were 20 (32.79%) of whom 10 (50%) were male and 10 (50%) were female. Those practicing in both the public and private sectors were 27 (44.26%), 11 (40.70%) of whom were male and 16 (59.30%) of whom were female. There was no statistically significant difference between the area of practice and gender with p=0.77.

On the year of clinical practice, 15 (24.59%) had practiced for 0 to 5 years. Of these, 7 (46.70%) were male while 8 (53.30%) were female. Those who had practiced for 6-10 years were 21 (34.43%) with 9 (42.90%) being male and 12 (57.10%) being female. 10 (16.39%) had practiced for 10-15 years with 4 (40%) and 6 (60%) being female. 15 (24.59%) had practiced for more than 15 years, 8 (53.30%) of whom were male and 7 (46.70%) female. The difference was however not significant with p=0.91.

On the nature of clinical practice, 35 (57.38%) were general dental practitioners. 15 (42.90%) were male and 20 (57.10%) were female. 26 (42.42%) were specialists, 13 (50%) of whom were male and 13 (50%) female. The difference was not significant with p=0.5

<table>
<thead>
<tr>
<th>TABLE 1: Area, years and nature of practice and gender</th>
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<tr>
<td>Male</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Area of practice</td>
</tr>
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</tr>
<tr>
<td>6-10</td>
</tr>
<tr>
<td>10-15</td>
</tr>
<tr>
<td>More than 15</td>
</tr>
<tr>
<td>Nature of practice</td>
</tr>
<tr>
<td>General dental practitioner</td>
</tr>
<tr>
<td>Specialist</td>
</tr>
</tbody>
</table>

Of the 61 respondents, 14 (22.95%) were in the public sector. Of these, 9 (64.29%) were in practice
between 0-5 years, 3 (21.49%) between 6-10 years, 1 (7.14%) between 10-15 and 1 (7.14%) more than 15 years in clinical practice.

Twenty (32.79%) of the respondents were in the private sector. Of these, 5 (25%) were in practice between 0-5 years, 7 (35%) were in practice between 6-10 years, 4 (20%) were in practice 10-15 years and 4 (20%) for more than 15 years.

Majority of the respondents 27 (44.26%) of the respondents were in both the public and the private practice. One (3.70%) was in practice between 0-5 years, 11 (40.74%) were in practice between 6-10 years, 5 (18.52%) were in practice between 10-15 years and 10 (37.04%) were in practice for more than 15 years. There was a significant difference with p=0.004.

FIGURE 1: Years Of Practice And Area Of Practice

between 6-10 years, 5 (18.52%) were in practice between 10-15 years and 10 (37.04%) were in practice for more than 15 years. There was a significant difference with p=0.004.

About their knowledge on the types of bonding agents available in dentistry, most dentists 47 (77%)
knew of self-etching primer and adhesive (2 step), 36 (59%) knew of total etch (3 step) while 25
(41%) didn’t know about it, while 14 (23%) did not know about it, 35 (57.4%) knew about the one
bottle type while 26 (42.6) did not know about it, 30 (49.2%) knew about the self-etching adhesive
(2 bottle) while 31 (50.8%) did not know of its existence, only 3 (4.9%) knew of other types of
bonding agents available while 58 (95.1%) did not know of any other.

**TABLE 2: frequency Of Types Of Bonding Agents Available**

<table>
<thead>
<tr>
<th></th>
<th>Total-etch</th>
<th>Self-etching primer &amp; adhesive</th>
<th>One bottle</th>
<th>Self-etching adhesive</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YES</strong></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td></td>
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<td>59</td>
<td>47</td>
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<td>42.6</td>
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<td>41</td>
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<td>41.40</td>
<td></td>
<td>50.8</td>
<td></td>
<td>95.1</td>
</tr>
</tbody>
</table>

Comparing the knowledge of types of bonding agents available and the area of practice, all the 61
respondents were involved. Out of the 14 (22.95%) in the public sector, 8 (57.10%) knew about total
etch while 6 (42.9%) did not know about it, 11 (78.60%) knew about self-etching primer and adhesive
while 3 (21.40%) did not know about it, 7 (50%) knew about self-etching adhesive while 7 (50%)
did not know about it, 3 (21.40%) knew about the existence of other types of bonding agents while
11 (78.60%) did not know of other bonding agents.

Of the 20 (32.79%) in the private sector, 7 (35%) knew about total etch, while 13 (65 %) did not know
about it, 14 (70%) knew about self-etching primer and adhesive while 6 (30%) did not know about it,
7 (35%) knew about the one-bottle type while 13 (65%) did not know about it, 6 (30%) of them knew
about self-etching adhesives while 14 (70%) did not know about it, 20 (100%) did not know of any
other types of bonding agents available.

27 (44.26%) were practicing in both the public and private sectors. Out of these, 21 (77.8%) knew
about total-etch while 6 (22.2%) did not know about it, 22 (81.5%) knew about self-etching primer
and adhesive while 5 (18.5%) did not know about it, 20 (74.1%) knew about one-bottle presentation
while 7 (25.9%) did not know about it, 17 (63%) knew about self-etching adhesive while 10 (37%) did
not know about it, and all the 27 (100%) did not know of the existence of any other type of bonding agents.

On the types of solvents used frequently in bonding agents, 8 (13.1%) said water only, 6 (11.5%) said
ethanol only, 23 (37.70%) said water and ethanol, 15 (24.60%) said acetone while 2 (3.3%) said other
types of solvents are used.

On the type of bond involved in bonding agents and tooth structure, 9 (14.8%) respondents said
chemical, 1 (1.6%) said mechanical while 48 (78.7%) said micro-mechanical.

Asked on how long dentine should ideally be etched, 3 (4.9%) of the respondents said 1-5 seconds,
35 (57.4%) said 5-15 seconds, 18 (29.50%) said 15-30 seconds, 3 (4.9%) said 45-60 seconds and
2 (3.28%) said 2 minutes.

On the situation in which collagen is best suited to form a hybrid layer with bonding agents, of the 61
respondents, 1 (1.60%) said it should be flooded, 43 (70.50%) said it should be moist, 16 (26.2%) said
it should be dry, none said it is not relevant and 1 (1.6%) said it should be used in other forms.
With regard to selection of bonding agents, out of the 61 respondents, 33 (54.1%) use bonding agents for cementation of crowns, veneers and bridges while 27 (44.3%) don’t, 9 (14.8%) use bonding agents to repair Glass ionomer cement while 52 (85.2%) don’t, 44 (72.1%) use bonding agents to treat dentine hypersensitivity while 17 (27.9%) don’t, 27 (44.3%) use bonding agents to repair ceramics while 34 (55.7%) don’t and 35 (57.40%) use bonding agents with fissure sealants while 26 (42.60%) don’t.

FIGURE 2: Clinical Uses Of Bonding Agents

On the frequency of use of bonding agents among dentists, 28 (45.98%) said they frequently use 4th generation bonding agents, 40 (65.68%) said they frequently use 5th generation bonding agents, 8 (13.10%) said they frequently use 6th generation bonding agents, 4 (6.6%) said they frequently use 7th generation bonding agents and none said that they frequently use any other type.
FIGURE 3: Frequency Of Use Of Dbah’s

Of these dentists, the reasons for selecting the specific type of bonding agents were high bond strength 26 (42.6%), ease of use 27 (44.38%), availability 35 (57.40%), 19 (31.18%) and other reasons 1(1.68%).
Of the 14 respondents practicing in the public sector, most of them 10 (71.43%) considered availability, 2 (14.29%) of them considered high bond strength, 6 (42.86%) considered ease of use, 3 (21.43%) considered cost and none considered other reasons. Of the 20 respondents in the private sector, most of them 11 (55%) considered ease of use, 8 (40%) considered availability, 8 (40%) considered high bond strength, 8 (40%) considered availability, 7 (35%) considered cost and none considered other reasons. Of the 27 respondents practicing in both the private and public sectors, most of them 17 (62.96%) considered availability, 16 (59.26%) considered high bond strength, 10 (37.04%) considered ease of use, 10 (37.04%) considered cost and none considered other reasons.

Brand names of commonly used bonding agents were found to be Scotchbond 33 (54.18%) of the respondents, Primebond 10 (16.40%), Optibond FL 7 (11.50%), Dentsply 3 (4.90%), Amelogen 2 (3.30%), Ventura 2 (3.30%), 3M ESPE 2 (3.30%), Metabond 1 (1.60%), Ultrabond 1 (1.60%) and Heliobond 1 (1.60%).

On the frequency of bonded restorations per week, almost half, 29 (47.50%) said they do 5-10, 8 (13.10%) dentists out of 61 said that they do between 0-5, 17 (27.90%) said they do 10-15, 4 (6.6%) said they do 15-20 and 3 (4.90%) do more than 20 bonded restorations per week.
FIGURE 5: Bonded Restorations Per Week

21 (34.40 %) have used bonding agents to repair ceramics while 31 (50.80%) have used bonding agents to treat dentine hypersensitivity. Of these, 2 (6.45%) always use bonding agents, 5 (16.13%) use bonding agents mostly, 18 (58.06%) use them sometimes, while 6(19.35%) only use bonding agents rarely and none uses them on special occasions.

On the duration of photo-curing bonding agents, 1(1.60%) out of the 61 respondents photo-cure for 5 seconds, 21(34.40%) photo-cure for 10 seconds, 18(29.50%) photo-cure for 30 seconds, 20 (32.80%) photo-cure for 40 seconds, while 1(1.60%) photo-cure for more than 1 minute.

When excess material is encountered during bonding, 1 (1.67%) said that they photo-cure, 27(44.30%) said that they air-dry the material, 19 (31.10%) said that they photo-cure and scrape off the excess, 12 (19.70%) said that they air-dry and re-apply the required amount and 2 (3.30%) said that they deal with it in other ways which they did not point out.

On comparing how dentists in various areas of practice deal with excess bonding agents, of those who photo-cure, 1 (1.67%) were in the public sector, of those who air-dry, 5 (18.50%) were in the public sector, 7 (25.9%) were in the private sector while 15 (55.60%) were in both practices. Of those who photo-cure and scrape-off the excess, 2 (10.5 %) were in the public sector, 12 (63.20%) were in the private sector and 5 (26.30%) were in both sectors. Of those who air-dry and re-apply the required amount, 5 (41.70%) were in the public sector, 1 (8.30%) were in the private sector and 6 (50%) were in both practices. Of those who dealt with excess bonding agents differently, 1 (50%) was in the
Table 3: Dealing With Excess Bonding Agents And Area Of Practice

<table>
<thead>
<tr>
<th></th>
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<th>Private Sector</th>
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<th>$X^2$</th>
<th>$p$</th>
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<tr>
<td>Photo-cure</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>18.18</td>
<td>0.20</td>
</tr>
<tr>
<td>Air-dry</td>
<td>18.50</td>
<td>25.90</td>
<td>63.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photo-cure &amp; scrape off</td>
<td>10.50</td>
<td>12</td>
<td>63.20</td>
<td>5.26</td>
<td>0.60</td>
</tr>
<tr>
<td>Air-dry and re-apply</td>
<td>41.70</td>
<td>8.30</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>50</td>
<td>0</td>
<td>50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The respondents who practiced in both private and public facilities were more that those who practiced in the private sector whereas the least number practiced in the public institutions. This can be explained by the larger numbers of private health care facilities in Nairobi compared to the public facilities as well as an increased number of part-time private practitioners. This finding is similar to outcomes on the distribution of dentists in Nairobi.\textsuperscript{12,13}

A sizeable number 47 (77\%) of respondents were aware of the self-etching primer and adhesive (2 step) which are 5th generation materials whereas more than half 35 (57.4\%) knew about the one bottle type 7th generation. In addition almost half of the respondents knew of total etch (3 step). These results depict that the dentists were knowledgeable on current advances in bonding agents. The knowledge could be attributed to frequent continuous development talks that enlighten professionals and perhaps the accessibility of information on-line. However very few knew of the most recent bonding agents at the time of data collection of this study, for example the one-bottle dual-cure type (8th generation). Being a very new bonding agent it is possible that the dentists who are mainly clinicians and not researchers may not have encountered it yet.

The knowledge on dentine etching time was also quite good with a sizeable number 35 (57.4\%) reported appropriate durations of etching dentine 5-15 seconds. However, 37.7\% indicated longer etching durations ranging from 29 seconds to 2 minutes whereas 4.9\% indicated shorter durations of 1-5 seconds. Studies that have been done outside Kenya did not seek to determine the knowledge of dentists neither has there been a study on knowledge of bonding agents locally.

In a study done on selection of DBA’s, Prime & Bond-a 5th generation bonding agent- was reported as the most popular DBA by 42\% respondents. In this study, majority of the respondents 65.68\% also said they frequently use 5th generation bonding agents, (45.98\%) said they frequently use 4th generation bonding agents, (13.10\%) said they frequently use 6th generation bonding agents and (6.6\%) said they frequently use 7th generation bonding agents. The results are consistent with the 5th generation bonding agents being the most frequently used. In Gary Alex’s\textsuperscript{14} study 55\% of dentists recommended 5th generation bonding agents while (35\%) recommended 4th generation total-etch systems. This could be due to availability of these materials in the market and the fact that most dental schools teach 4th and 5th generation systems making dentists bias towards these materials once in practice. In addition, Lynch C.D et al\textsuperscript{9} actually established that in Canada and the United States...
of America 4th and 5th generation total etch were the most common bonding systems taught in dental schools.

McFadzean et al 8 found out that availability, reported by (44%) respondents, was the most popular reason for choice of a DBA, followed by ease of use, reported by (38%) respondents, and reliability, reported by (17%) respondents. In this study, the reasons considered by dentists during selection of DBA’s were high bond strength 26(42.6%), ease of use 27(44.38%), availability 35(57.40%), cost 19(31.18%) and other reasons 1(1.68%). Availability was the reason most dentists consider in both studies and this is attributed that most dentists may practice in areas that are not their own private practices and hence may settle for the available bonding agent. Cost was one factor in this study that was not in McFadzean’s study as this directly impacts on day-to-day running of practices and more so on the cost of a bonded restoration. More respondents in this study consider high bond strength (reliability) and ease of use than McFadzean’s study.

Commonly used bonding agents brand names were Scotchbond33(54.18%) of the respondents, Primebond10(16.40%), Optibond FL7(11.50%) with the rest using other brand names. This was consistent with the responses on the bonding agent generations as Scotchbond and Primebond are both available as 5th generation bonding agents. Scotchbond is also available as a 4th generation material.

In this study, 31(50.80%) had used bonding agents to treat dentine hypersensitivity. However, 18(58.06%) used these materials only at times for this purpose. Gibson M et al 15established that dentine bonding agents provides the greatest improvement in dentine hypersensitivity at 2 weeks and 6 months. In an almost similar study, Cruz J.C et al 16 found out that bonding agents were among the most successful treatments in treating dentin hypersensitivity. The pattern of use locally can be attributed to low knowledge on the use of bonding agents for this purpose and the availability of other options like desensitizing dentrifices.

When excess material is encountered during bonding, 1(1.67%) said that they photo-cure, 27(44.30%) said that they air-dry the material, 19(31.10%) said that they photo-cure and scrape off the excess, 12(19.70%) said that they air-dry and re-apply the required amount and 2(3.30%) said that they deal with it in other ways which they did not point out. Of those who photo-cure and scrape-off the excess, 2(10.5 %) were in the public sector, 12(63.20%) were in the private sector and 5(26.30%) were in both sectors. This is possibly because most of those in the private sector run their own practices and cost of the procedure is of the essence. It could also be that due to the push to do many procedures to meet targets or incomes in the private practice, there may be no time to repeat procedures.

**Conclusion**

Within the limitations of this study, knowledge on bonding agents was found to be relatively high with most dentists being aware of 3 and 2 step DBAs. Knowledge on the recommended etching time for dentine was however average. The most frequently used BAs were 4th and 5th generation bonding agents and the reasons why most dentists selected BAs were availability and ease of use.
Recommendations

1. Further studies should be conducted in other parts of the country so as to obtain conclusive information on the knowledge, attitude and use of bonding agents.
2. Continuous education using workshops and conferences to educate dentists on current developments on bonding agents.
REFERENCES

UTILIZATION OF CONE BEAM COMPUTED TOMOGRAPHY IN CURRENT DENTAL PRACTICE IN NAIROBI

Ochola T J1, Masiga JJ2, Musima BL2, Imalingat B2, Odhiambo A3

1Division of Dental & Maxillofacial Radiology, School of Dental Sciences, University of Nairobi
2Dental & Maxillofacial Imaging Centre (DAMIC)
3Department of Diagnostic Radiology and Imaging, School of Medicine, University of Nairobi

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Abstract

Introduction: Cone Beam Computed Tomography (CBCT) first came to commercial use in 1999. Its discovery created a myriad of possibilities never before imagined in the practice of dentistry. Numerous indications have been reported using three dimensional (3D) imaging in practically all fields of dentistry. Despite this, however, the utilization of CBCT in Sub-Saharan Africa in general and Kenya in particular has not been reported.

Aim: The objective of the study was to assess the utilization of CBCT services among Dentists in Nairobi

Methods: This was a retrospective, cross-sectional descriptive study of patients’ CBCT records at the dental and maxillofacial Imaging center done from January 2013 to December 2013. The scans were performed using a CS 9000C 3D System, manufactured by Carestream Dental (Kodak Dental Systems), it had a focused field of view (FOV).

One hundred and thirty four referral forms and their corresponding images were obtained from the digital database. Data on the patients’ age, gender and indication for the scan and image characteristics evaluated from the referral forms and the central image database.

Results: 134 examinations in 132 patients (67% female, 33% male) were performed. The mean age of the subjects was 49 years (SD 15.4) and age range 25-59 years. The main indication for the examination was implant planning in 54%. Diagnosis or exclusion of periapical infection represented 22% of the examinations, and tooth/root or foreign body localization 10%. Pre-surgical assessment prior to third molar surgery accounted for 5% of the cases while 6% of the examinations were indicated for pain and discomfort after endodontic therapy and for evaluation of canal morphology prior to endodontic treatment.

Conclusion: Utilization of CBCT is still relatively low among dentists in Nairobi and the indications are mainly for pre-implant planning. Notably, indications for endodontic assessment and periapical infection evaluation was slowly increasing.

Introduction and Literature review

For most dental practitioners, the use of advanced imaging has been limited because of cost, availability and radiation dose considerations; however, the introduction of cone-beam computed tomography (CBCT) for the maxillofacial region provides opportunities for dental practitioners to request multi-planar imaging.

Two-dimensional (2D) images have provided diagnostic evidence for dentistry and medicine for many years, and there is little doubt that 2D images will continue to contribute to diagnostic processes.
for years to come. The chief limitation of current conventional intraoral and panoramic imaging for dento-alveolar diseases is the problem of superimposition which is largely the result of the representation of a 3D structure depicted by a two-dimensional (2D) image. It is becoming apparent that CBCT imaging may indeed be the next major advancement in dento-alveolar imaging, providing true 3D imaging at a lower cost than conventional CT, and much lower radiation risk. The use of CBCT raises questions such as the following: Does CBCT offer additional value in the diagnosis and treatment planning of clinical dentistry? Does three-dimensional (3D) evaluation contribute to improved patient care and treatment outcomes? The answers to these questions are important for dentists who need to understand the advantages, disadvantages, and indications for use of this imaging modality in day to day clinical practice.

Several studies have proved the superiority of CBCT over the conventional 2D studies. For example, CBCT offers high quality high resolution imaging and the technique is easy to apply and has easy-to-use postprocessing and viewing software. The biggest drawback in utilization of CBCT in our setting is the fact that it is definitely more expensive than classical two-dimensional radiologic investigations. The dose of ionizing radiation generated is greater than in a panoramic investigation and as a new technology, it requires new competences from the clinician and the value of information obtained is interpretation-sensitive. In addition, any movement artifacts will affect the whole data set around the whole image rather than just one part. Perhaps of great significance for delineation of certain pathologies, is the fact that it provides limited resolution of deeper (inner) soft tissues, and MRI and medical CT are thus better for soft-tissue imaging. Other technical limitations have been found to include relative low contrast range and apparent increased noise from scattered radiation and concomitant loss of contrast resolution.

Over the last decade, the various clinical indications for CBCT have been well documented. In Endodontics, CBCT has been reported to be a very useful tool in diagnosing apical lesions. It is also agreed that CBCT is superior to peri-apical radiographs in detecting root fractures, particularly whether they are bucco-lingual or mesio-distal. In cases with inflammatory root resorption, lesions are detected much easier in early stages with CBCT compared to conventional 2-D examinations. CBCT can also be used to determine root morphology, the number of roots, canals and accessory canals, as well as to establishing the working length and angulations of roots and canals. In oral and maxillofacial surgery assessment, CBCT enables the analysis of jaw pathology, the assessment of impacted teeth, supernumerary teeth and their relation to vital structures. The role of CBCT in analyzing and assessing paranasal sinuses are well documented.

Perhaps the greatest indication for CBCT is in the area of implant dentistry where there has been increased demand for replacing missing teeth with dental implants and where accurate measurements are needed to avoid damage to vital structures. Initially, this was achievable with conventional ICT. However, with CBCT giving more accurate measurements at lower dosages, it is the preferred option in implant dentistry today. In addition, it has been stated that precise periodontal pocket measurements obtained from CBCT scans are as accurate as those obtained using a periodontal probe. Despite these advancements, the role of CBCT in sub-Saharan Africa remains unreported. The first ever study on the utilization of CBCT in Kenya indicated that out of 5,000 radiographic examinations at a radiology center in Nairobi, only 97 were CBCT, accounting to just 1.5%. In that study, the prevalence of incidental findings derived from CBCT was found to be particularly high at 73%, a fact which further stresses the value of this investigative technique in the management of patients with suspected dental and maxillofacial pathology.
Materials and Methods
The study was conducted at Dental and Maxillofacial Imaging Centre (DAMIC) in Nairobi. This is a private imaging service center and was the first in the area to provide CBCT imaging. In addition, the center offers various digital imaging techniques including orthopantomograms, cephalograms, skull radiography and intraoral imaging. The center receives referrals from private dental practitioners as well as from public hospitals. The research was a retrospective cross-sectional descriptive study and formed part of an audit at the facility. CBCT scans available in archives and manual request forms of dental and maxillofacial patients were reevaluated and data representing patient age, gender and indication for the examination was recorded, where the clinical indication was not indicated on the referral form, this information was obtained from the referring clinician. The sample included 134 CBCT scans that had been done from January 2013 to December 2013. The scans were performed using a CS 9000C 3D System, manufactured by Carestream Dental (Kodak Dental Systems), it had a focused field of view (FOV).

It uses the CS 3D imaging software 3.2.9 which was used to analyze the images. Three volumes are separately acquired and stitched together in order to cover a large part of the mandible or the maxilla. The system also reconstructs axial, sagittal and coronal views to create a 3D rendering. The referral form is designed to capture patient biodata such as name, sex, date of birth and contact address. In the selection column, the referring clinician is required to tick off the desired procedure or to specify the procedure where it is not listed. The form also has provision for special instructions and relevant clinical history.

Results
During the twelve-month period, 134 examinations in 132 patients (67% female, 33% male) were performed. The mean age of the subjects was 49 years (SD 15.4) and age range 25-59 years.

The main indication for the CBCT examination was to plan for implant placement and this was seen in 54% of the images. Diagnosis or exclusion of periapical pathology represented 22% of the examinations, and tooth/root or foreign body localization 10%. Pre-surgical assessment prior to third molar surgery accounted for 5% of the cases while 6% of the examinations were indicated for pain and discomfort after endodontic therapy and for evaluation of canal morphology prior to endodontic treatment.

In the implant planning and tooth/root localization examinations the required information was subjectively obtained in all cases except in three implant planning examinations.

In the three examinations, artifacts caused by restorative materials hampered exact measurements in two of the cases, while artifacts caused by a surgical plate was responsible for degraded image properties in one case.

When compared with conventional radiography, additional radiographic information was obtained in 62% of the CBCT examinations performed to confirm or exclude dental infection.
Table 1. Description of the subjects and their indications for CBCT referral

<table>
<thead>
<tr>
<th>Age Range</th>
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<td>Total</td>
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<td>Males</td>
<td>44</td>
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<tr>
<td>Female</td>
<td>90</td>
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<table>
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<th>Indication for CBCT (n)</th>
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<td>Pre-Implant Assessment</td>
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<td>Evaluation for Periapical pathology</td>
<td>29</td>
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<tr>
<td>Localization of tooth root and supernumerary teeth</td>
<td>13</td>
</tr>
<tr>
<td>Evaluation during and after endodontic therapy</td>
<td>8</td>
</tr>
<tr>
<td>Impacted mandibular third molar</td>
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</tbody>
</table>

Discussion

The increasing use of CBCT examinations requires critical evaluation of its possible advantages in comparison with conventional imaging methods. When a CBCT examination is planned, careful consideration should be given to whether the additional information contributes to the diagnosis and what the impact on the patient’s treatment.

The cost of a CBCT examination is about 10 times higher than a set of intra-oral periapical examination and 5 to 7 times higher than a dental panoramic tomogram. This cost factor may be critical in a clinician’s decision to refer a patient for this examination. This study shows a steadily increasing utilization of CBCT by dentists in Nairobi. In an earlier study, Kihara et al reviewed 97 CBCT scans from the same center taken over a two year period, representing 1.5% of the total images performed. In the current study, we evaluated 134 scans taken over a period of 12 months and representing a slight but definite increment in utilization. This slight increment may be attributed to sustained sensitization program by the center and also the increasing number of dentists performing implant dentistry compared to the past.

Pre-implant placement assessment was the major reason for referrals for CBCT in this study, accounting for 54% of the cases. This is slightly less than that found by Kihara et al in their study one year earlier. The reason can be attributed to an increased number of referrals due to endodontic assessment which accounted for 22%, diagnosis of periapical pathology (6%).

CBCT enables the assessment of bone quality and bone quantity thus leading to reduced implant failure, the use of CBCT allows for case selection to be based on much more reliable information. This advantage is also used for post-treatment evaluation and to assess the long-term success of treatment.
(Fig 1)

Fig 1:  A) Conventional 2D view of implants replacing 11 and 21. The patient presented with marked mobility of the implant.
B) 3D rendering of the same patient demonstration complete lack of bone support.

The increase in referrals for endodontic assessment is an indication of an increase in horizontal spread of utilization of this imaging modality among the dentists in question. Endodontic applications include the diagnosis of periapical lesions due to pulpal inflammation.

(Fig 2),

visualization of canals, elucidation of internal and external resorption

Fig 2: Patient presented with persistent pain on 44.
A) Convetional periapical view of the tooth revealed an ill defined area of radiolucency suggestive of a periapical infection.
B) CBCT saggital view revealed the extent of the lesion in the bucco-lingual dimension.
Fig 3A) Conventional IOPA of a 27 year old male patient whose dentist had noted a radiolucency overlying 11. A diagnosis of external root resorption was arrived at after a CBCT scan.

B) Coronal scan of the same patient

C) Sagittal scan of the patient revealing the depth of the lesion

D) Axial scan was able to show that the lesion, though extensive, did not involve the pulp.

Other indications in this area of dentistry include delineation of cysts, granulomas, periapical lesions as well as evaluation of fractured instruments in canals, as well as evaluation of maxillary sinus involvement after apical infection. In the current study, a majority of indications for endodontic assessment was for maxillary molar teeth. This finding is
consistent with the universal dilemma facing dentists during endodontic therapy because of the tendency for these teeth to have three or more root canals and complex root canal morphology which are frequently superimposed on two-dimensional images when using conventional radiographic techniques.

Studies have shown that identification, treatment planning, and evaluation of potential postoperative complications of impacted teeth are greatly improved by adding the 3D image through CBCT. The relationship of impacted third molars to the mandibular canal, and the relationship of impacted maxillary canines and supernumerary teeth to cortical borders and adjacent roots is important diagnostic information that can directly impact the outcome of surgery (Fig 4).

A) Panoramic view showing impacted 13, 15 and also impacted 25 associated with supernumerary teeth pericoronally.

B) And C) Saggital scans of the same patient showing the exact bucco-palatal location of 15 and 25.

In the current study, seven cases out of 134 were referred for evaluation of impacted teeth prior to surgery. This relatively low number of referrals for assessment of impacted mandibular third molars can only be explained by fact that the diagnosis of this condition is initially made from evaluation of a dental panoramic tomogram which in itself, may be adequate and cost effective from
the practitioner’s point of view.

It has been previously reported that artifacts can produce problems in 3D images.\textsuperscript{16}

This was confirmed in our study where restorative material and Titanium surgical plates caused disturbing artifacts in the diagnosis.

This study noted the absence of referrals for CBCT for assessment of intra-osseous pathology, periodontal diseases, orthodontic diagnosis and TMJ evaluation which points to a need for increased sensitization of the benefits of this imaging modality among dentists.

**Conclusion**

In the current study, the utilization of CBCT was shown to be relatively low and predominantly limited to pre-implant assessment but steadily growing in area of endodontic assessment and localization of internal structures as well as in pre-surgical evaluation of impacted teeth.
References
INFORMATION FOR CONTRIBUTORS

The Journal of Kenya Dental Association (JKDA) is a quarterly publication that provides a forum for publication of original scientific articles, reviews, clinical case reports and correspondence concerning the dental sciences and oral health care. The JKDA editorial process: All the manuscripts submitted to the JKDA are peer reviewed, and every submission will be acknowledged by email where possible. The first stage of review examines the originality of the material presented, scientific relevance and statistical consistency. The manuscripts are then further reviewed by an external referee before discussion and possible approval at the editorial panel meetings. A final decision on publication should be communicated to the author(s) within 3 months of manuscript submission. However, use of international referees can cause a longer period and authors’ understanding is requested in such circumstances. Proofs will be sent to authors of the manuscripts except in the case of letters and obituaries.

Manuscript submission: All materials submitted to be considered for publication should be submitted exclusively to the JKDA, with signed consent from all authors. For hospital based scientific articles and clinical case reports, written permission must be obtained from the Director or Superintendent of the hospital where the research was conducted or the case(s) were managed. Articles should report data from original research that is relevant for the provision of oral health care in developing countries. Reviews must be comprehensive analyses of the subject matter, giving a current and balanced view of the issues discussed. Case reports must be authentic, appropriately illustrated and of critical significance to the practice of dentistry. Letters to the editor should not be more than 800 words and should contain only one illustration with less than 5 references. Priority shall be given to letters responding to articles published in the journal within four months. Editorials are usually commissioned but unsolicited communications of up to 1 000 words are welcome. These will also be subjected to a peer review process. Obituaries which are of interest to the JKDA readership may also be submitted. The formal obituary should contain the following information: full names, date and place of birth, education history, degrees and qualification, year and place of qualification, recent appointments and achievements, family members and date and cause of death.

Format and Style: Manuscripts should be submitted in triplicate in English, typed in size 12 Times New Roman font with double-spacing on one side of numbered A4 pages with a left-hand margin of not less than 40mm. The AIMRADAR format should be used wherever applicable, that is, Abstract, Introduction, Materials and Methods, Results and Discussion, Acknowledgements and References. The title page should include the name(s) of the author(s), addresses and appointments or designations at the time of undertaking the study. The corresponding author should be clearly indicated and is requested to provide an email address. Articles should be between two and four thousand words, with a maximum of eight figures. Case reports are limited to one thousand five hundred words, inclusive of a structured summary of not more than one hundred words. Obituary announcements should be not more than 400 words, accompanied by a good quality colour passport size photograph. Each manuscript should include a summary not exceeding 300 words. This must be in the form of a Structured Abstract to include (where relevant) the following headings: aim(s) or objective(s), study design, setting, participants, interventions/methods, main outcome measures, results and conclusions. For reviews, the abstract should be structured according to objective(s), data sources, study selection data extraction and conclusions. Statistical methods should be defined and the level of significance used clearly stated.
If the manuscript is part of a series of publications or if essential components of the paper such as methodology have been published elsewhere, copies of related papers already published should also be submitted. Any non standard questionnaire should also be submitted for possible publication as indexes if considered necessary by the reviewers.

**Submissions by email.** Papers and articles for submission may be sent as Word file attachments by email. Figures may also be sent by appropriate file attachment but hard copy by post may also be requested. Files must be virus checked before sending but if discovered to be infected may be deleted without opening and the sender informed.

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2. World Health Organization. World Health Report (Online) 2005. URL: http://www.who.int/whr/2005/r; accessed on 05.06.05.

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